

## **REMARKS**

Claims 1-2, 4-8, 10-15, 17-21, and 23-26, all the claims pending in the application, stand rejected on prior art grounds. Applicants respectfully traverse these rejections based on the following discussion. The following paragraphs are numbered for ease of future reference.

### **I. The 35 U.S.C. §101 Rejection**

[0001] Claims 1-2, 4-8, 10-15, 17-21, and 23-26 stand rejected under 35 U.S.C. §101 because the Office Action asserts that the claimed invention is directed to non-statutory subject matter. These rejections are traversed as explained below.

[0002] Regarding the rejection of claims 1-2, 4-8, 10-15, 17-19 under 35 U.S.C. §101, the Federal Circuit Court of Appeals in *In re Bilski*, \_\_\_ F.3d \_\_\_ (Fed. Cir. 2008)(*en banc*) (hereinafter referred to as *Bilski*) recently held that to be statutory a process must be either tied to another statutory class (such as a particular apparatus) or (2) transform underlying subject matter (such as an article or materials) to a different state or thing. As amended, independent claims 1, 8 and 14 include method steps that are tied to a machine (in this case a computerized system performing a method of self-diagnosis). Also as amended, independent claims 1, 8 and 14 include method steps that transform underlying subject matter to a different state or thing (i.e., recorded features of normal operations into a report of anomalous events). In view of the foregoing, the Examiner is respectfully requested to reconsider and withdraw these rejections.

[0003] Regarding the rejection of claims 20-21 and 23-26, the Federal Circuit Court of Appeals in the case of *In re Beauregard*, 53 F.3d 1583 (Fed. Cir. 1995) (hereinafter referred to as *Beauregard*) held that claims directed to a “program storage device readable by a machine,

tangibly embodying a program of instructions executable by the machine to perform method steps for [overall function of software], said method steps comprising:[conventional method claim elements describing software]” are patentable. It should be noted that the Board for Patent Appeals and Interferences also recently followed the Beauregard decision in Ex parte Bo Li, Appeal 2008-1213 (BPAI 2008) (hereinafter referred to as BoLi) Since claim 20 specifically claims “A program storage device readable by computer and tangibly embodying a program of instructions executable by said computer to perform a method of automatically identifying anomalous situations during operations of a computerized system, said method comprising ...”, the Applicants submit that independent claim 20 and its dependent claims 21 and 23-26 are similarly allowable.

[0004] In view of the foregoing, the Examiner is respectfully requested to reconsider and withdraw these rejections.

## **II. The 35 U.S.C. §112, First Paragraph, Rejection**

[0005] Claims 1-2, 4-8, 10-15, 17-21, and 23-26 stand rejected under 35 U.S.C. §112, first paragraph. These rejections are traversed as explained below. The Office Action provides that claims 1-2, 4-8, 10-15, 17-21, and 23-26 are rejected under 35 U.S.C. §112, first paragraph because the current case law (and accordingly, the MPEP) require such a rejection if a §101 rejection is given because when Applicant has not in fact disclosed the practical application for the invention, as a matter of law there is no way Applicant could have disclosed how to practice the undisclosed practically application.

[0006] As discussed in detail above with regard to the rejection of claims 1-2, 4-8, 10-15, 17-21, and 23-26 under 35 U.S.C. §101 the claimed invention is directed to statutory subject matter, as defined by the Federal Circuit Court of Appeals in *Bilski* and in *Beauregard*. Given the fact that the only basis for the rejections of claims 1-2, 4-8, 10-15, 17-21, and 23-26 under 35 U.S.C. §112 is the existence of the rejections of those same claims under 35 U.S.C §101, the Examiner is respectfully requested to reconsider and withdraw the rejections.

### **III. The Prior Art Rejections**

[0007] Claims 1-2, 4-8, 10-15, 17-21, and 23-26 stand rejected under 35 U.S.C. §102(e) as being anticipated by Klein (U.S. Patent No. 7,027,953), hereinafter referred to as Klein. Applicants respectfully traverse these rejections based on the following discussion.

[0008] MPEP§2131, discussing rejections under 35 U.S.C. §102, provides that “A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference.” *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987).” The Applicants submit that Klein does not teach or suggest the following patentable features of amended independent claims 1, 8, 14 and 20: (1) “A method of performing, by a computerized system, self-diagnosis by automatically identifying anomalous situations during operations of said computerized system;” (2) “recording, by said computerized system, actions performed by said computerized system during normal operations of said computerized system, said actions being stored in a first file as features of said normal operations”; (3) “automatically creating, by said computerized system, models for said features of said normal operations in said first file, wherein each model

comprises a mathematical statement that predicts a value of a corresponding feature based on relationships with all other features;” (4) “calculating, by said computerized system, anomaly scores of said features of said normal operations and storing said anomaly scores in a second file, wherein said anomaly scores are predictive of whether each of said features will be normal according to previously defined standards when one or more of the other features are abnormal according to previously defined standards;” and (5) “automatically identifying, by said computerized system, anomalous events in said live operations based on said anomaly scores and on said threshold.”

[0009] More particularly, Klein discloses embodiments of a method/system for diagnosing or maintaining the health of a mechanical system based on an analysis of the vibration patterns of components of the mechanical system (see col. 2, lines 45-54). Specifically, an overview of Klein’s three-stage method for diagnosing a mechanical system is provided at col. 6, lines 14-45. That is, the first stage of Klein is engine vibration data processing, which includes data evaluation, outlier’s elimination (elimination of clearly invalid data) and trend smoothing. The second stage is feature extraction, where that features are snapshot, short-term shifts, long-term shifts and varying-term shifts, each of which provide different information about an engine. The third stage is classification, where each of the features is classified by several diagnostic methods.

[0010] Figure 5 and the associated text at col. 9, lines 20-67, describe these stages in more detail. That is, in the first stage, normal and defective vibration signatures are stored 440. Furthermore, vibration data is collected and new signatures are created 450. In the second stage, features are extracted from the newly created signatures and compared with the features of

known signatures 470. If a novel pattern of features is detected in a newly created signature, a new diagnostic cycle (i.e., the third stage) is triggered 480, beginning with the Failure Mode Analysis 480. Failure Mode Analysis includes exploring the specific failure, understanding its mechanism, determining its impact on system signature, etc. Based on this analysis the decision process is adapted.

[0011] The Applicants submit that since Klein discloses a discrete system for monitoring a mechanical system based on component vibrations, it does not disclose the claimed method of performing, by a computerized system, self-diagnosis by automatically identifying anomalous situations during operations of said computerized system.”

[0012] Additionally, the Office Action cites col. 23, lines 54-64, of Klein as disclosing both the limitations of “recording features of normal system operations of said computerized system in a history file;”” and “automatically creating a model for each of said features of said normal operations, wherein said model comprises a mathematical statement indicating what a corresponding feature equals in terms of relationships with all other features”. The Applicants respectfully disagree.

[0013] As amended, the recording limitation reads as follows: “recording, by said computerized system, actions performed by said computerized system during normal operations of said computerized system, said actions being stored in a first file as features of said normal operations”. Thus, the claim limitation relates specifically to recording the *actions performed by a computerized system* during normal operations and not to recording *vibration patterns exhibited by a mechanical system* when in operation (as in Klien). Therefore, the Applicants submit that the recording limitation, as claimed, is not disclosed by Klein.

[0014] As amended, the creating limitation reads as follows: “automatically creating, by said computerized system, models for said features of said normal operations in said first file, wherein each model comprises a mathematical statement that predicts a value of a corresponding feature based on relationships with all other features”. The Applicants submit that the cited portion of Klein does not disclose that a model is automatically created for each of the features of normal operation of a computerized system (i.e., each of the actions performed by the computerized system during normal operations), much less that each model comprises a mathematical statement that predicts a value of a corresponding feature based on relationships with all other features. That is, as discussed above with regard to Figure 5 and the related text in Klein, both normal and defective vibration signatures for domains of interest in a mechanical system are stored. Then, during subsequent operation of the mechanical system, new vibration data is collected, new signatures are created and the features of the new signatures are compared to known signatures. At col. 23, lines 40-54, Klein explains that once a novel signature indicative of an anomaly is detected, the system is retrained so that the detected anomaly is considered a “known” defect for subsequent processing. The cited portion of Klein (i.e., col. 23, lines 54-64) refers to how this retraining is performed. Nowhere in Klein does it teach or discuss that models are created for each feature of normal operations or, more particularly, that each model is a mathematical statement that specifically predicts a value of a corresponding feature based on relationships with all other features.

[0015] It should be noted that the Office Action equates the reference to “algorithms” in the cited portion of Klein to the mathematical statement claimed. The Applicants respectfully disagree. The cited portion of Klein refers to the fact that, after retraining, new parameters are

obtained for decision process algorithms, thus allowing a specific anomaly to become a “known” defect that can be automatically detected. While Klein discloses the use of algorithms during a decision process, nowhere in Klein does it teach or disclose the claimed mathematical statement that specifically predicts a value of a corresponding feature based on relationships with all other features.

[0016] The Office Action cites col. 2, lines 65-67 and col. 3, lines 1-8 and lines 28-38 of Klein as teaching the feature of “calculating anomaly scores of said features of said normal operations and storing said anomaly scores in a trained file, wherein said anomaly scores are predictive of whether each of said features will be normal when one or more of the other features are abnormal”. The Applicants respectfully disagree.

[0017] The cited portion of Klein refers to the fact that vibration signatures in different domains of interest are indicative of different types of faults. These faults being mechanical faults, such as, cracks in blades, degraded bearings, engine compressor stalls, damaged gearboxes, improper assembly, etc. (see col. 3, lines 28-38). Every fault type is associated with a pointer that defines a frequency region of a vibration pattern. The vibration pattern is compared to a baseline pattern for that fault type to produce an index which indicates a deviation from an expected normal pattern for that fault type. In other words, for a given fault type, Klein compares a current vibration pattern to a previously established baseline to determine if the current pattern is normal and, more specifically, how far it deviates from normal. Contrarily, the calculating feature of the present invention relates to calculating anomaly scores for the different actions performed during normal operations by a computerized system (i.e., different features of normal operations) such that the anomaly scores are predictive of whether each of the features

will be normal when one or more of the other features are abnormal. The indices of Klein reflect how abnormal a current vibration signature is, relative to what is considered a normal vibration signature, not how likely it is to be normal when others are abnormal. Col. 3, lines 28-38 refers to specifically to the ability of the Klien system to not only diagnose abnormal patterns, but also to predict failures. However, nowhere does Klein teach or disclose “calculating anomaly scores of said features of said normal operations and storing said anomaly scores in a trained file, wherein said anomaly scores *are predictive of whether each of said features will be normal* when one or more of the other features are abnormal.”

[0018] The Office Action cites col. 27, lines 13-15 and col. 28, lines 1-10 of Klein as disclosing the feature of “automatically identifying anomalous events in said live operations based on said anomaly scores and on said threshold.” The Applicants respectfully disagree. Columns 27-28 describe a feature extraction process, wherein the actual signature of a system is compared to a baseline. The comparison is performed specifically by calculating a set of diagnostic indexes for each predefined pointer in a failure pattern. The diagnostic indexes are aggregated using relative weights and an aggregate feature provides an indication of component health for the analyzed fault condition (i.e., the aggregate feature would indicate the likelihood that the corresponding component were failing). This determination could be made by comparing the aggregate feature to a threshold level. Contrarily, in the present invention, an event that is detected during live system operations is identified as anomalous or not based on both a threshold and on anomalous scores (which as discussed above are predictive in light of other features being abnormal). Nowhere does Klein teach or disclose “automatically identifying anomalous events in said live operations *based on said anomaly scores and on said*



*threshold.”*

[0019] Therefore, the Applicants submit that independent claims 1, 8, 14 and 20 are patentable over Klein. Furthermore, dependent claims 2-7, 9-13, 14-19 and 21-26 are similarly patentable, not only by virtue of their dependency from a patentable independent claim, but also by virtue of the additional features of the invention they define. Moreover, the Applicants note that all claims are properly supported in the specification and accompanying drawings. In view of the foregoing, the Examiner is respectfully requested to reconsider and withdraw the rejections.

#### **IV. Formal Matters and Conclusion**

With respect to the rejections to the claims, the claims have been amended, above, to overcome these rejections. In view of the foregoing, Applicants submit that claims 1-2, 4-8, 10-15, 17-21, and 23-26, all the claims presently pending in the application, are patentably distinct from the prior art of record and are in condition for allowance. Therefore, the Examiner is respectfully requested to reconsider and withdraw the rejections to the claims and further requested to pass the above application to issue at the earliest possible time.

In addition, the claims have been amended to remove the language that was previously added to comply with new Rule 37 CFR 1.75(b), now that the enactment of Rule 37 CFR 1.75(b) has been permanently enjoined by the courts.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary. Please charge any deficiencies and credit any overpayments to Attorney's Deposit Account Number 50-0510.

Respectfully submitted,

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